

## ABSTRACT

The popularity of pasta is increasing worldwide due to its convenience, palatability, longer shelf life. Gluten in pasta is one of the most paramount factors affecting pasta properties. However, in certain genetically susceptible individuals, an autoimmune disorder such as celiac disease (CD), triggered by the ingestion of gluten-containing grains can occur. Considering the need of developing gluten free product, the present research was aimed to develop a process technology for pre-cooked gluten free rice based pasta by incorporating chickpea flour using twin screw extrusion technology. The influence of extruded rice flour and chickpea flour on the rheological and textural properties of gluten free rice based pasta dough was studied. The addition of extruded rice flour resulted in an increase of elastic ( $1.2 \times 10^5$  to  $4.54 \times 10^5$  Pa) and viscous moduli ( $4.5 \times 10^4$  -  $7.2 \times 10^4$  Pa) at 1 Hz and lowered  $\tan \delta$  (0.44 to 0.12), which indicated that it is distinctively more elastic in nature. Ingredient optimization of gluten free pasta was done using response surface methodology. The maximum sensory score, cooking quality, rehydration ratio and minimum solids loss were identified at 401.2 g/ kg rice flour, 362.30 g/kg water, 126.5 g/kg of extruded rice flour, 105.0 g/kg of chickpea flour and 5.0 g/kg of xanthan gum. The optimization of twin-screw extrusion process and effect of process variable was studied. It was found that with the increase in the barrel temperature, cooking loss and cooked weight reduced, but expansion ratio, percentage of gelatinized starch, resistant starch, firmness and surface stickiness of gluten free rice based pasta increased. The optimized process variables were feed moisture content 35.0 %, barrel temperature 95 °C and screw speed 110 rpm. Effect of different drying temperature (low, medium and high) on properties of gluten free rice pasta was investigated. Pasta dried at higher temperature (90 °C) lowered the stickiness (12.45 - 7.62 g·s), water absorption, elongation and enhanced sensory score at the optimum cooking time. A rapid method was developed using FT-NIR coupled with PLS regression to provide a rapid solution to accurately quantify the moisture content in pasta during drying in the range of 12.5 % to 15.0 % w.b. Shelf lives as well as spoilage kinetics were monitored using electronic nose. Shelf life of fresh (undried) pasta under refrigerated (4 °C) condition was 21 days.

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**Keywords:** Celiac disease, Gluten free pasta, Drying, Twin screw extrusion, Electronic nose, FT-NIR, Response surface methodology, Microstructure, Rheology, Rice flour, Chickpea

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